

E949 gamma analysis

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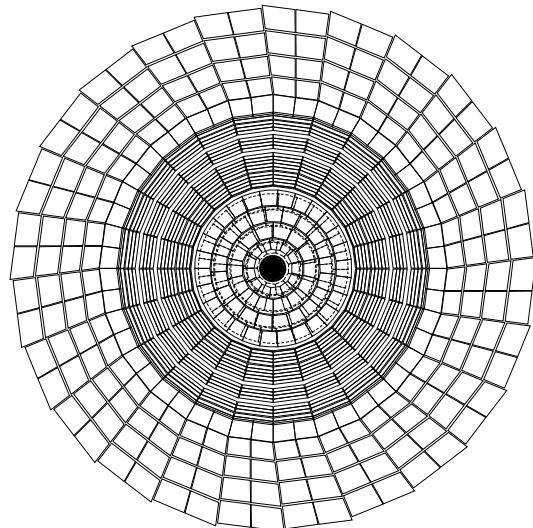
- Introduction
 - E949-02 gamma trigger, dataset
 - previous results (E787-91)
- $K^+ \rightarrow \pi^+ \gamma\gamma(1)$: T. Yoshioka (Univ. Tokyo)
- $K^+ \rightarrow \pi^+ \gamma$: TKK
- $K^+ \rightarrow \pi^+ \gamma\gamma\gamma$: T. Nakano
- discussions on gamma trigger/analysis in future

gamma triggers @ E787 and E949

'91	pgg1	$K^+ \rightarrow \pi^+ \gamma\gamma(1)$	limit	PRL'97
	pgg2	$K^+ \rightarrow \pi^+ \gamma\gamma(2)$	observation	PRL'97
'96-97	1 γ	$K^+ \rightarrow \pi^+ \gamma$	limit	PR-D'02
'02	γ	$K^+ \rightarrow \pi^+ \gamma\gamma(1)$ $K^+ \rightarrow \pi^+ \gamma$	observation further search	

γ -02 trigger compared to E787 pgg1-91 (1)

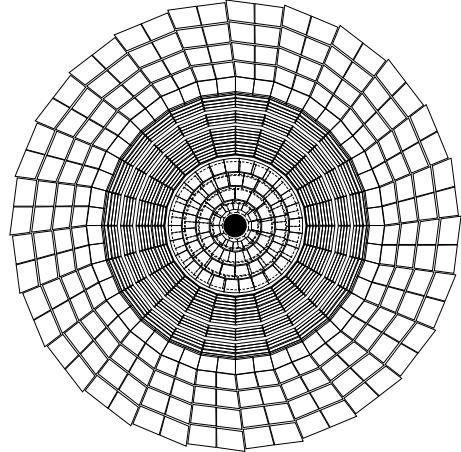
- stopped kaon decay (minbias): $K_B \cdot DC \cdot T \bullet 2$
- π^+ Track with long range: - Level-1.n



- RS layer 16, 17:
$$\frac{(6_{ct} + 7_{ct}) \cdot (8_{CT} \cdot \dots \cdot 16_{CT})}{(18_{CT}) \cdot (19_{CT})}$$
- veto BVL hits in CT sectors:
$$\overline{(20_{CT})} \cdot \overline{(21_{CT})}$$
- RS layer 15 – 18:
$$\frac{(6_{ct} + 7_{ct}) \cdot (8_{ct} + \dots + 10_{ct}) \cdot (11_{CT} \cdot \dots \cdot 15_{CT})}{(19_{CT} + 20_{CT} + 21_{CT})}$$
- Range Mask, RS Energy Cut

γ -02 trigger compared to E787 pgg1-91 (2)

- stopped kaon decay (minbias): $K_B \cdot DC \cdot T \bullet 2$
- π^+ Track with long range: RS layer 16, 17, Lev1.n
- Photons:



- showers in BVL-BV: $BVL \cdot BV$
- ACP photon Clustering cut
- no γ in EC, RS: $\overline{EC} \cdot \overline{HEX}$

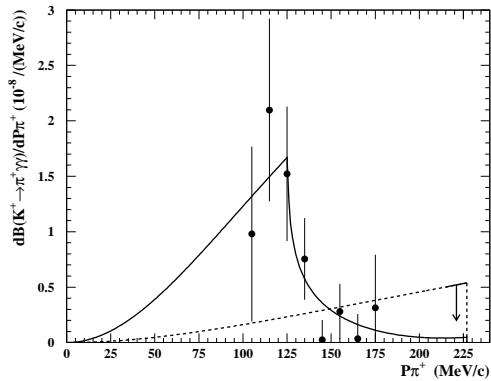
γ -02 dataset compared to E787 pgg1-91

* in SMX from run 49036(Apr-24) to the end(Jun-09)

	γ -02	pgg1-91
prescale	1	2
ev/spill	25	1
N_{KB_L}/ps	11.6×10^{11} ($\times 22$)	5.29×10^{10}
# of trigger	$12. \times 10^6$ ($\times 16$)	7.3×10^5

$K^+ \rightarrow \pi^+ \gamma\gamma$ in E787-91

- $\pi^+ \gamma\gamma(1)$: $P_{\pi^+} > 215 \text{ MeV}/c$
 $\rightarrow 0$ events, $< 5.0 \times 10^{-7}$ (Phase Space dist)
- $\pi^+ \gamma\gamma(2)$: $100 < P_{\pi^+} < 180 \text{ MeV}/c$
 $\rightarrow 31$ events, $(6.0 \pm 1.5 \pm 0.7) \times 10^{-7}$



Prospects for $K^+ \rightarrow \pi^+ \gamma\gamma(1)$ in E949

- $\pi^+ \gamma\gamma(1)$ region is sensitive to the models of Chiral Perturbation Theory (ChPT)
- We should observe $3 \sim 6$ signal events if the current ChPT model is correct.